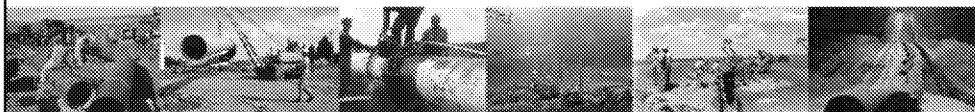




INGAA – EPA Follow-up Call on Subpart OOOOa Proposed Amendments

June 5, 2019



Agenda



- Introductions
- Discuss INGAA's conclusion that annual LDAR surveys achieve 75 – 80% reduction for natural gas operations, including transmission and storage (T&S)
 - ✧ Answer any remaining questions about INGAA's comments
 - ✧ INGAA relied on information from the Canadian Association of Petroleum Producers (CAPP) Leak Control Program
- Summary, Conclusions & Discussion

Overview of INGAA's Comments



- INGAA concluded that the “best available” information on survey frequency is from CAPP studies which show that annual surveys for T&S achieve 75 – 80% reduction in leak emissions
 - EPA’s TSD estimated ~80% reduction for quarterly surveys
- The CAPP reports address:
 - 1) Leak emission estimates and % reduction achieved
 - 2) Leak mitigation program elements (which are analogous to LDAR)
 - 3) Frequency of surveys (i.e., annual for most components) per CAPP BMP

CAPP Reports



- CAPP reports (see links in last slide and in notes section)
 - ✧ Baseline emissions
 - ✧ Leak mitigation program components and criteria
 - ✧ Post-control emissions
- All CAPP studies were completed by *a single company*
 - ✧ Conducted by Clearstone Engineering
 - ✧ Dave Picard, the President of Clearstone, is an acknowledged expert
 - EPA-GRI GHG study participant
 - IPCC co-author
 - Hired by EPA as an expert consultant on oil & gas air emissions

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- The leak control program is documented in two primary CAPP publications (which reference a third CAPP document)
 - CAPP Report “Update of Fugitive Equipment Leak Emission Factors,” February 2014 (**2014 CAPP EF Report**); EPA-HQ-OAR-2010-0505-4826
 - CAPP Best Management Practice “Management of Fugitive Emissions at Upstream Oil and Gas Facilities,” January 2007 (**2007 CAPP BMP**); <https://www.capp.ca/publications-and-statistics/publications/116116>
- Baseline (pre-BMP) leak emissions (**CAPP, 2005**) based on:
 - CAPP Technical Report “A National Inventory of Greenhouse Gas (GHG), Criteria Air Contaminant (CAC) and Hydrogen Sulphide (H₂S) Emissions by the Upstream Oil and Gas Industry. Volume 5, Compendium of Terminology, Information Sources, Emission Factors, Equipment Sched’s and Uncertainty Data AND Volume 3, Methodology for Greenhouse Gases” September 2004

CAPP Leak Emissions Reduction Performance



- Large Canadian study of leak emissions and leak surveys at natural gas operations, including natural gas compression
 - * Post BMP leak survey results from **8 companies** at **120 facilities**, comprising an **estimated 276,947 equipment components**
 - Direct measurement of leak emissions at 115 of 120 facilities
 - Established estimation methods used at 5 facilities
 - * Pre-BMP “leak survey results for **251,431 equipment components**”
- CAPP report concludes 75% reduction was achieved:
 - “A comparison of the two (leak survey) data sets indicates that, overall, the ***emissions due to fugitive equipment leaks have decreased by 75 percent since the implementation of DI&M programs***” (refer to pg ii, 20, & 21 of the 2014 CAPP EF Report)
- Lower leak definition (M21 screening value) in Subpart OOOOa and ongoing surveys are likely to accomplish a marginally higher incremental reduction, so 75-80% reduction is a reasonable conclusion

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The 2014 CAPP EF Report “presents updated average emission factors for estimating emissions from fugitive equipment leaks at upstream oil and natural gas (UOG) facilities.”

“The updated factors are reflective of current conditions at UOG facilities that have implemented DI&M programs in accordance with the BMP and applicable regulatory requirements.”

“leak survey results for 120 facilities (8 companies) in Alberta and British Columbia, comprising an estimated 276,947 equipment components”

“The previous factors (CAPP, 2005) were developed based on measurement results collected from the mid 1990’s to early 2000’s.”

“leak survey results for 251,431 equipment components”

Scope of CAPP Leak Control Program

- “Directed Inspection and Maintenance” (DI&M) from CAPP studies is based on leak mitigation program derived from EPA-GRI study results and a related EPA Natural Gas Star “Lessons Learned” document (Oct. 2003)
 - * i.e., “voluntary” alternative to LDAR prior to mandatory programs
- CAPP followed DI&M approach for facilities across natural gas operations, including compressor stations
- Program scope and components are analogous to mandatory LDAR, with some latitudes
 - * e.g., requirements such as survey frequency are defined in “BMP” and may vary depending on engineering judgment of leak likelihood
 - * See additional details in notes section

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- The 2007 CAPP BMP “provides guidance on implementing directed inspection and maintenance (DI&M) procedures to specifically target fugitive equipment leaks”
 - “objective is to minimize the potential for leaks in the most practical manner possible”
 - “designed to apply primarily to fugitive equipment leaks from components in natural gas or hydrocarbon vapour service”
 - DI&M overview: detected leaks repaired if (1) pose environmental, health, or safety concerns or (2) are readily fixed. Repair decision may include *measurement* of leak rates, and leaks that are economical to repair are repaired. Other leaks are tracked. Refer to 2007 CAPP BMP Figure 1
- The 2014 CAPP EF Report “examined facilities include those in both sweet and sour service, oil production facilities and natural gas facilities ranging from single-well batteries and compressor stations through to gas processing facilities”

CAPP Leak Mitigation Program: Includes All Elements Typical for LDAR



The 2007 CAPP BMP provides guidance on DI&M program elements (*primary provision*):

- * Leak definition (*10,000+ ppmv*)
 - Lower leak threshold (500 ppmv) in Subpart OOOOa
- * Leak detection (*Method 21, OGI, soap solution*)
- * Leak rate measurement (*hi-vol sampler, bagging, flowmeter*)
- * Target components (*all gas-service components included*)
- * Leak monitoring frequency (*primarily annual*)
- * Inaccessible components (*excluded, but repair if/when practical*)
- * Tagging components (*all leakers*)
- * Leak repairs (*45 days or next shutdown*)
- * Personnel training
- * Primary calibrations and field checks
- * Record-keeping

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Leak definition (2007 CAPP BMP Section 3.2.2) – EPA Method 21 screening value of 10,000 ppmv or more

Leak detection (2007 CAPP BMP Sections 3.2.3, 3.2.4) EPA Method 21; “Emerging technologies” such as infrared optical technology (OGI); bubble tests/soap solution, ultrasonic leak detectors, electronic gas detectors, etc.

Leak quantification (2007 CAPP BMP Section 3.2.4) “Potentially valid leak quantification methods may include, but are not limited to, process modelling, material balances, flow capture and metering systems, duct sampling techniques, tracer tests and some types of remote sensing methods.” Bagging, high volume sampler, and rotameter are listed.

2014 CAPP Report calculated total fugitive emissions by two methods: (1) Post-2007 leak frequency data and CAPP Leak ($\geq 10,000$ ppmv) and No-Leak ($< 10,000$ ppmv) emission factors (5 of 120 facilities); (2) Post-2007 leak detection and measurement results for leaking components and estimation of emissions contributions from non-leaking components using the CAPP No-Leak emission factors (115 of 120 facilities).

Pre-BMP emissions based on emission factors “developed based on results of a field studies conducted by Clearstone Engineering over the period 1992 to 2003 for oil and gas facilities in Western Canada”

Target Compounds (2007 CAPP BMP Section 3.2.5) – Both Subpart OOOOa and the CAPP BMP require leak monitoring of all components that are potential sources of fugitive emissions.

Inaccessible components (see 2007 CAPP BMP Section 3.2.7)

Personnel Training (2007 CAPP BMP Section 3.2.10); “Proper personnel training should be part of the DI&M program”

Primary Calibrations and Field Checks (2007 CAPP BMP Section 3.2.11); “All instruments used to detect and measure leaks should be factory serviced or serviced by a factory authorized technician and should be calibrated regularly as per the specification of the manufacturer or whenever problems arise”

Record-keeping (2007 CAPP BMP Section 4) Recommended records include: (1) “Records of repairs made on leaking components, including leak repair frequency” (2) The economic analysis performed on all leaking equipment components that have not been fixed on the basis that this is uneconomic to do and do not pose any safety, health, or environmental concerns”

CAPP Program Elements: Survey Frequency

- Monitoring Frequency (2007 CAPP BMP Section 3.2.6)

"The equipment components most likely to leak should be screened most frequently. Studies indicate that components subject to vibration, high use, or temperature cycles are the most leak-prone. Operators should develop a DI&M survey schedule that achieves maximum cost-effective fugitive emissions reductions yet also suits the unique characteristics and operations of their facility."

- BMP, Appendix 1 provides leak detection survey frequency guidance for various "leak-prone" equipment components.

- Annual surveys recommended for control valves, block valves, emergency vents, PRVs, and OELs
- Quarterly surveys recommended for compressor seals and blowdown systems (note: compressor seals are *not* LDAR components in Subpart OOOOa – e.g., rod packing addressed via prescribed maintenance schedule)
- For other components that are less "leak-prone," such as flanges and connectors, annual or less frequent surveys recommended

- Conclusion: annual or less frequent surveys were conducted for nearly all T&S components

CAPP Program Elements: Leak Repair



- * Leak Repairs (2007 CAPP BMP Section 3.2.9)

- * BMP Section 3.2.1 states "Once a leak is determined to need fixing, this should be done within a reasonable period of time (see Section 3.2.9), or at the next facility turnaround if a major shutdown is required."

"Decisions to repair or replace leaking components should be made on a case-by case basis in consideration of health, safety, environmental, and economical concerns. Where feasible, repairs or replacements should be done within **45 days** from the time a leak is detected. . . . A leaking component need not be repaired if the component is shown to be uneconomical to repair and does not pose a safety, health, or environmental concern. In such cases, the components should remain tagged/identified and be rescreened at the next scheduled leak survey."

- * Tagging components (2007 CAPP BMP Section 3.2.8)

- * Recommended a tracking mechanism for leaks that are not repaired

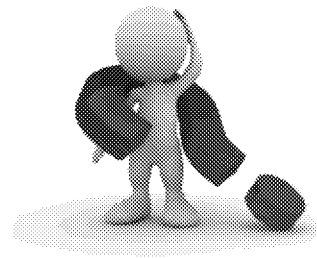
"All leaking components should be flagged using a tag or an alternative method for identification purposes as well as to ensure that the component is repaired and that it will be given appropriate follow-up attention under the company's DI&M program. This should assist in identifying the proper monitoring frequency for that specific component."

Summary & Conclusions



- Although imperfect, the CAPP leak study is the most reliable and best supported estimate of leak emissions reductions for natural gas operations
- Key takeaways from the CAPP study:
 - ✧ Emission estimates were based on measurement and/or established methods
 - ✧ DI&M was the established approach for voluntary T&S leak mitigation prior to promulgation of LDAR regulations; DI&M program components are analogous to LDAR program requirements
 - ✧ Annual survey frequency (or less frequent) was commonly utilized per CAPP BMP
 - ✧ On average, annual LDAR surveys can achieve about 75 – 80% reduction in leak emissions

Questions & Discussion



Attachment: CAPP Leak Control Program Documents



- The leak control program is documented in two CAPP publications
 - * CAPP Report "Update of Fugitive Equipment Leak Emission Factors," February 2014 (**2014 CAPP EF Report**)
 - ... EPA-HQ-OAR-2010-0505-4826
 - * CAPP Best Management Practice "Management of Fugitive Emissions at Upstream Oil and Gas Facilities," January 2007 (**2007 CAPP BMP**)
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 - ... <https://www.capp.ca/publications-and-statistics/publications/86226>
 - ... <https://www.capp.ca/publications-and-statistics/publications/86223>
- The entire study / all CAPP documents were completed by Clearstone Engineering